



Department of Toxic Substances Control



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**California Department of Toxic Substances Control Comments on
U.S. EPA DRAFT GUIDANCE FOR EVALUATING THE VAPOR INTRUSION TO
INDOOR AIR PATHWAY FROM GROUNDWATER AND SOILS, NOVEMBER 2002
Attention Docket ID No. RCRA-2002-0033**

The California Department of Toxic Substances Control (DTSC) wishes to thank the United States Environmental Protection Agency (U.S. EPA) for the opportunity to review and comment on the above-referenced draft Guidance document. Comments presented herein are a result of the joint efforts of DTSC's Indoor Air Workgroup, consisting of representatives from DTSC's Hazardous Waste Management Program, Site Mitigation Program, Human and Ecological Risk Division, Geological Services Unit, and Public Participation Unit. The Indoor Air Work Group's comments are split into two topics: 1) input parameters and calculations performed in the Guidance; and 2) application of the Guidance.

Comments on the input parameters used or calculations performed in the Guidance:

1. **Appendix G - Considerations for the Use of the Johnson and Ettinger (J&E) Vapor Intrusion Model:** This appendix should be enhanced to better discuss the rationale for selection of appropriate modeling parameters. Many of the model parameters are not discussed at all, and are simply presented in Tables. Section 3.2 discusses a few of the modeling parameter values in more detail. Concern arises when selecting certain parameter values that are physically inconsistent and potentially mutually exclusive. For example, simultaneously assuming a very low air exchange rate ($AEH = 0.25$ = number of volumetric air exchanges per hour) and an assumed Q_{soil} of 5 liter/minute is not reasonable. A major factor influencing the Q_{soil} value is the convective flow established by a large volumetric air flow. While these assumptions will be "conservative", it is not reasonable to assume they will occur simultaneously, especially when evaluating long term average concentrations used for risk assessment purposes.

The basis of the assumed crack ratio has limited discussion, other than to say that "The selected default values fall within the ranges observed." DTSC

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recommends expanding the discussion regarding selection of appropriate crack ratio values.

In using the J&E model for developing target concentrations on Table 3, the Guidance does not clearly specify whether it uses the slab-on-grade or basement scenario. Figure 3 indicates that the basement scenario was used, but this is not explicitly stated in the Guidance. We recommend that the Guidance clarify this matter so that users are fully aware of the assumptions behind the model results.

On a positive note, DTSC encourages the use of the J&E model when used with site-specific data on soil geotechnical, geochemical, and physical parameters.

2. **Distance from Contaminant Source:** The guidance document states that the vapor intrusion pathway does not warrant evaluation if contaminant sources are greater than 100 feet away vertically and laterally from buildings. As for the 100 feet vertical distance from contaminant sources, this implies that insignificant vapor flux occurs near the surface with deep contaminant sources. However, Figures 3a and 3b in the guidance document clearly shows that this is not the case. The trend of the attenuation factors in Figures 3a and 3b become asymptotic with depth rather than approach zero. Hence, when extrapolating attenuation from Figures 3a and 3b for greater depths, the attenuation factors for contaminant sources at 100 feet are probably not significantly different from attenuation factors for contaminant sources at 125 feet. As for the 100 feet lateral distance from contaminant sources, U.S.EPA should provide additional technical justification, besides the empirical data from Colorado, for the selection of this value.
3. **U.S.EPA Johnson & Ettinger Model Spreadsheets:** Discrepancy exists between the number and types of constituents of concern listed in the Guidance and the U.S.EPA J&E model EXCEL spreadsheets. The Guidance should provide additional criteria, other than Henry's Law Constant, for the determination of chemicals to be included within the indoor air screening process. For example, many semi-volatile organic compounds could be excluded from the Guidance if boiling point, pure-phase solubility, and vapor pressure were used as criteria for chemical selection.
4. **Toxicity Factors:** DTSC is required to use toxicity factors developed by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHHA) where the values are more appropriate.
5. **Use of Soil Gas Data vs. Groundwater Data:** DTSC affirms the primary importance of using soil gas data over groundwater data, specifically when the source is in the vadose zone. Although DTSC agrees with the Guidance on this issue, there were some remarks aired during the recent San Francisco workshop

that “soil gas is least reliable” and “groundwater data is more reliable”. DTSC disagrees with this opinion, based on years of experience using soil gas as a principal tool for investigating volatile organic compounds (VOCs). In addition, since vapor phase migration is the focus of indoor air risk assessment, soil gas data should be considered the most direct measurement of vapor phase constituents rather than groundwater data. Furthermore, the use of groundwater data requires the assumption of perfect mixing and equilibrium partitioning at the air-water inter-phase, which is not always borne out by observation.

6. **Use of Bulk Soil Data:** While we consider soil gas data most preferable of all, we believe that good quality bulk soil data (i.e., soil matrix data) may be useful in certain situations and should not be completely discounted. Selection of appropriate data is highly dependent on site-specific conditions. For example, some sites (such as sites in the San Francisco Bay area underlain by Bay Mud), are not conducive to soil gas sampling. Some of the uncertainties related to soil sampling can be significantly reduced by conforming to performance standards of EPA Method 5035A. With regard to the uncertainties related to partitioning assumptions, laboratory experiments have shown a strong correlation between bulk soil concentrations and associated soil gas concentrations (Hewitt, 1998). At any case, it is essential that reliable site-specific soil parameters are used in the partitioning calculations.

One such situation is when an initial assessment of indoor air risk is needed and the only data available are bulk soil data. If the bulk soil data are of good quality and site-specific soil parameters are available, it is quite easy to calculate the equilibrium vapor concentration and make an estimation of potential indoor air risk before soil gas data are collected. Another situation where bulk soil data may be preferred is when the soil gas data are deemed questionable because data were collected during the wet season when soil air permeability is limited, and the measured vapor concentrations may not be representative of true concentrations during warm dry months. In this case, bulk soil data and appropriate partitioning assumptions may be used to predict maximum vapor concentrations during the summer months.

For the reasons given above, and because site cleanup levels are historically stated in units corresponding to bulk soil concentrations (e.g., mg/kg), DTSC recommends that the Guidance provide appropriate discussion on the judicious use of bulk soil data and partitioning assumptions.

7. **Use of MCL as Cap Values:** The use of the Maximum Contaminant Level (MCL) to set the “caps” on certain chemical concentrations in the look-up tables for Target Groundwater Concentrations means that for those chemicals, the concentrations may not be truly risk-based. We recommend that the Guidance indicate risk-based threshold concentrations even if they are below MCL. If risk-

based concentrations are not available, use MCLs, but clearly indicate in the footnote that MCLs are regulatory drinking water standards that may not be protective of inhalation risk due to vapor migration.

8. **Variation in Attenuation Factors:** The attenuation factor for benzene may be much different than the attenuation factors for chlorinated volatile chemicals because of its greater potential for biodegradation. This fact should be addressed in the text as well as Appendix F of the Guidance. Generic attenuation factors should be used with caution; there is absolutely no substitute for proper site characterization prior to any modeling effort where actual exposure is suspected and risk management decisions have to be made.

Comments on the Use of the Guidance:

9. **Potential Misuse of Generic Screening Levels:** The potential for misuse of the Guidance's generic screening levels exists. DTSC recommends inclusion of a statement in the Guidance that advises the users to be aware of all assumptions and limitations before using the generic screening levels.
10. **Conservative Screening Levels:** Many if not most screening levels of the constituents of concern listed in the Guidance may be too conservative, and may force the evaluation of almost all sites having subsurface volatile chemical contamination.
11. **Evaluating Future Risk:** Future risk evaluation is not adequately addressed in the draft Guidance. Only one paragraph in the Guidance (page 38, fourth paragraph) appears to address how to deal with the future risk scenario in areas where buildings currently do not exist or are not available for sampling. Because much of DTSC's work involves addressing the future risk scenario, DTSC recommends expanding the Guidance to clarify dealing with this scenario. Several issues warrant further clarification for addressing the future risk scenario. For example, the Guidance suggests use of mathematical modeling to evaluate the potential for inhalation risks, but does not specifically identify criteria upon which models would be considered acceptable. Also, the Guidance does not adequately discuss options for direct measurements of potential impacts for future risk. More discussion is needed regarding the decision logic and criteria for selection of direct measurement and sampling methods, types of methods, and advantages and limitations of methods. In addition, the Guidance suggests reduction of potential exposures with a mechanical ventilation system in the event buildings are constructed over subsurface vapor sources. The Guidance should clarify how an agency would get involved to impose engineered controls for future constructed buildings. At this time, unless there is a transfer of

ownership and an existing deed restriction, DTSC would not necessarily be aware of construction of new buildings, and would not have a mechanism to impose engineered controls such as mechanical ventilation systems. Radon mitigation systems are routinely implemented in the Northeast for residential housing at a very moderate cost (approximately \$2,500.00 per residence) and methane mitigation systems are implemented in California, in certain areas, for a moderate cost. However, large commercial, brownfield developments have been “killed” by the possibility of long-term operations and maintenance for mitigation systems where future development over an existing VOC plume will require mitigation. The current guidance lacks foresight into future land development, changes in future land use, and guidance to address these issues.

12. **Data Review:** Before data are entered into the proposed national database, a rigorous data quality/assurance evaluation should be performed by the submitting agency.
13. **Cumulative Risk:** The generic screening tables deal only with individual chemicals and associated threshold levels. However, most sites have more than one chemical and cumulative risk cannot be addressed by the simple, screening levels. Theoretically, one could have a situation where the screening level of a single chemical is not exceeded but, with multiple chemicals under this scenario, the cumulative risk could easily be exceeded.
14. **Site Characterization:** DTSC cannot over emphasize the need for adequate site characterization prior to any site risk determination. Once one moves into indoor air sampling without adequate site characterization, interpretation of the data becomes more difficult and complex.
15. **Public Outreach:** The draft public outreach guidelines are good in their overall direction. Whether the outreach leads to credibility, trust and cooperation depends largely on the timing of the activity and the administering agency representative’s candor and empathy. Of particular importance is early contact with the affected individuals and a continued open relationship. Although these guidelines address outreach for indoor vapor investigation, it is important to understand that the working relationship with the community is based upon the full experience with the administering agency. It is presumed that the indoor air vapor investigation is only one part of an ongoing investigation and therefore should be part of a larger outreach effort for the entire project.

Following EPA and Department of Toxic Substances Control outreach guidance, the optimal time to begin creating a trusting relationship is prior to fieldwork. Our experience has shown that if contact is made with the affected individuals or community prior to fieldwork, the investigation activities go much smoother. This first contact is based upon an acceptable and expected social protocol, that of

introducing yourself to an individual and recognizing their presence. The timing is important as the project has not yet begun and therefore the introduction is to meet each other and explain the site investigation process while simultaneously collecting information from the community regarding the site history. As the investigation continues, the affected community/individual needs regular updates (e.g., fact sheets, meetings, etc.) on the findings and future activities. During these updates, the investigating agency continues to receive questions and comments from the community/individual. To aid in what could be a long-term relationship, these questions and concerns must be addressed as they arise. The continued dialogue helps to ensure the community is aware of the facts and is prepared for future activities (interim actions, indoor vapor investigation, etc.). The administering agency benefits by understanding the community and, when possible, adjusting activities to minimize impact on the community/individual.

16. **Appendix H:** Based on the overall framework stated in comment no. 15, the following specific comments are given for Appendix H.
 - a. Include in “getting to know the neighborhood”, unions. If conducting work within a commercial setting, the union can be an excellent way in which to share information with local workers who work and eat in the area.
 - b. While conducting outreach, ensure everyone has access to the information. For instance, translate written information and interpret oral communications into appropriate languages for the community; and include a TDD number in all written communications.
 - c. When conducting outreach ensure community leaders can contact Administering Agency representatives directly through e-mail, telephone and mail.
 - d. When informing affected community members/individuals, use face-to-face meetings as the primary mode for first contact on all phases of the investigation. Specifically, if working with a small group of residents/businesses, first meet with the individual to inform them that a vapor investigation is being planned; conduct a second meeting to review (perhaps for a second time) the vapor investigation steps and review the questionnaire with them; a third meeting to leave the canister; and a fourth meeting to explain the results. These personal meetings conducted in candor and with empathy, provide a direct exchange of information thereby enhancing factual information left with the community and creating trust in the administering agency. If the project is working with a large number of residents/businesses, try holding the first meeting as a public forum and then break into small work groups to discuss the questions and concerns. The smaller groups will provide opportunities to review the

investigation steps a second time, thus enhancing the individual's recollection of this new information. The small groups will also allow those individuals who are not comfortable with large groups to voice their questions and concerns.

- e. To further educate the community/business representatives, create a video that simply explains vapor intrusion pathways and methods used to detect it.
- f. In the implementation of the site specific Public Participation Plan, ensure the information repository is convenient to the impacted community/business area.
- g. Implementing outreach activities is resource intensive. If the community/residential area is large, consider establishing a community liaison group consisting of community members. They can act as a distributor of information to the larger group, similar to neighborhood watch captains.
- h. In Appendix H, number 5 "for areas targeted for indoor air sampling", the preferred approach for contacting individuals should be "in person" versus "via phone and mail". Although it is recognized that telephone and mail are used as communication devices, the first contact should be personal due to the level of personal intrusion associated to this type of sampling. As stated in the general comment regarding outreach, this direct approach will provide the impacted individual with immediate access to factual information through informal discussions.
- i. For Appendix H, number 6 regarding when to schedule appointments, see comment number 15 above.
- j. In Appendix H, number 7, "Communicating indoor air sampling results", the Guidance lists sending letters to residents. The next bullet lists phone calls. While it is not recognized if the order of these activities is chronological, we believe the Guidance should suggest an order for specific outreach activities. For reasons listed above, the information should first be communicated in person. If that is not possible, a phone call followed by a letter is preferred.
- k. It is strongly suggested the Guidance emphasize direct communications that allow for an immediate question and answer period. This allows for assimilation of the information with a knowledgeable person present that can address questions as they arise. By providing long-term access to the Adminstrating Agency's representatives, it also allows a continued

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exchange of information that reduces the amount of misinformation while creating a high degree of trust and credibility.

Thank you again for the opportunity to comment on the draft Guidance. If you have any questions, please don't hesitate to contact me at (714) 484-5423 or kbaker@dtsc.ca.gov.

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